J. Soil Sci. and Agric. Eng., Mansoura Univ., Vol. 5 (3): 311-326, 2014

BENEFICIAL EFFECTS OF SOME GROWTH REGULATORS ON ONION (*Allium cepa* L.) GROWN UNDER ORGANIC FARMING COMPARING WITH MINERAL FERTILIZATION.

El-Sirafy, Z. M.[*]; A. M. El-Ghamry[*]; S. H. Sarhan[**] and A. G. Baddour[**]

*** Soil Dept., Fac. of Agric., Mans., Univ.**

**** Soil, Water and Environ. Ins. Agric. Research Center, Giza, Egypt.**

ABSTRACT

A field experiment was conducted at the experimental farm of Faculty of Agric.; El-Mansoura Univ. during the winter season of 2011-2012 to investigate the various combinations among organic manures, growth regulators and biofertilizers on the production of safe and economic onion bulbs. Twenty four treatments were arranged in complete randomized block design with 3 replicates as follows; 1- Farmyard manure (FYM), 2- FYM + humic acid (HA), 3- FYM + cytokinin (CK), 4- FYM + yeast (Y), 5- Compost rice straw (CRS), 6- CRS + H.A, 7- CRS + CK , 8- CRS + (Y), 9- Compost town refuse (CTR), 10- CTR + HA, 11-CTR+CK, 12- CTR+Y. All treatments were studied twice; one in the presence of a mixture of multi strains inoculants and the other without it. Also, the recommended doses of N, P and K fertilizers for onion were put in consideration as a control treatment. Thus, the total numbers of treatment were 25 treatments.

Results revealed that; the application of organic manures under investigation gained less vigor plant growth, total bulb yields and its components and nutrient content of onion bulbs as compared to the application of inorganic fertilizers (N,P and K at RD). Within the organic manure sources; the best parameters were attained by onion plants receiving CRS followed by that supplied with FYM and lately CTR. Inoculation of onion seedlings with the mixture of multi strains inoculants in combination with the growth regulators studied and the various organic manures under this investigation gave higher magnitude for all studied parameters than the application of organic manure alone. Moreover, such effect of this interaction gave, approximately the same values of inorganic fertilization for all the aforementioned traits.

Keywords: organic manures, growth regulators, biofertilizer and onion plant

INTRODUCTION

In recent years, increased concerns for healthy food production and environmental quality and increased emphasis on sustaining the productive capacity of soils have raised interest in the maintenance and improvement of soil fertility through appropriate land use and management practices (Puget and Lal, 2005)

The organic manures have the possibility supplying macro and micro nutrients, improving soil physical and chemical properties, providing energy of

micoflora, increasing the availability of micronutrients and improving soil fertility. The major obstacle of organic manures utilization is the quantities of available plant nutrient are insufficient to meet crop requirements. So recycling of different organic wastes as composted manure as well as using FYM in conjunction with some growth regulators; humic acid, cytokinin and yeast in the presence and absence of a mixture of biofertilizers would be a good source of organic manure to increase the yield and quality of onion plant besides ensuring hygienic disposal of the organic wastes. (Mansour, 2012).

Humic acid is one of the major components of humic substances. Humic matter is formed through the chemical and biological humification of plant and animal materials and through the biological activities of microorganisms (Anonymous, 2010). Humic substances have a very profound influence on plant growth, either directly or indirectly. The indirect effects of humic compounds on soil fertility include; increasing soil microbial population including beneficial microorganisms, improving soil structure and increasing in the CEC and pH buffering capacity of the soil. Directly, humic acid compounds may have various biochemical effects either on cell wall, membrane permeability level or the cytoplasm, causing increased photosynthesis and respiration rates in plants, enhanced protein synthesis and enhancing the uptake of minerals through the stimulation of microbiological activity (Mayhew; 2004)

Cytokinins (CK) are a class of plant growth substances (Phytohormones) that promote cell division in plant roots and shoots. They are involved primarily in cell growth and differentiation, but also have effect on apical dominance, axillary bud growth and leaf senescence (Choi *et al;* 2010). Cytokinins are involved in many plant processes including cell division and shoot and root morphogenesis. Cytokinins have been shown to slow aging of plant organs by preventing protein breakdown, activating protein synthesis and assembling nutrients from nearby tissues (Grobkinsky *et al.*; 2011). The known physiological effect caused by cytokinin can be summarized as follows; stimulates cell division and the growth of lateral buds, release of apical dominance, stimulates leaf expansion resulting from cell enlargement and promotes the conversion of etioplasts into chloroplasts via stimulation of chlorophyll synthesis.

Yeast extract is a natural bio-substances suggested to be of useful promotional and nutritional functions due to their hormones, sugars, amino acids, nucleic acids, vitamins and mineral content. Thus it can accelerate cell division and enlargement. Also, enhance synthesis of nucleic acids, protein and chlorophyll as well as, promote the formation of flower initiation (Dawa *et al.*; 2008). The positive effect of dry yeast may be attributed to its active role in the hydrolysis of pectic substances. It is known that vitamins, enzymes and coenzymes are important component of the yeast. Also, yeast increases the release of carbon dioxide through fermentation process which effectively activates photosynthesis and accelerates biosynthesis of carbohydrates and protein. Moreover, it increases the synthesis of plant growth promoters

especially, GA_3, IAA and cytokinin. In addition, yeast contains different nutrient elements, amino acids and vitamins which promote the uptake of different nutrient elements through the modification of the uptake of different solution towards acidity medium (Manoly and Nasr; 2008)

As the universe is going now on the way of clean agriculture and minimizing pollution effects, organic and biofertilizers became of the best management products to improve soil characteristics and productivity. They are considered as the most important factor in reducing the application of the inorganic fertilizers, consequently, reduce the adverse environmental impact of chemicals**.** The organic acids produced by microbial colonization on the mineral surfaces greatly accelerated the release of mineral elements to solution from feldspar sample. Microbes can enhance mineral dissolution rate by producing and excreting metabolic by-products that interact with the mineral surface. Micro-organisms can secrete growth promoting substances, e.g., indole acetic acid, gibberellins, cytokinins like substances and auxins. Biofertilization technology has taken a part to minimize production costs and at the same time, avoid the environmental hazards (Baddour 2010)

This investigation aimed to study the effects of humic acid, yeast and cytokinin in the presence and absence of mixture of multi strains inoculants on the onion growth, yield, quality and nutrient content compared to inorganic fertilization (control).

MATERIALS AND METHODS

In order to obtain the objective of this investigation; a field experiment was undertaken at the experimental farm of Faculty of Agric. El-Mansoura Univ. during the winter season of 2011-2012 to investigate the various combinations among organic manures, growth regulators and biofertilizers on the production of safe and economic onion bulbs.

24 treatments were arranged in complete randomize block design with 3 replicates as follows; 1- Farmyard manure (FYM), 2- FYM + humic acid (HA), 3- FYM + cytokinin (CK), 4- FYM + yeast (Y), 5- Compost rice straw (CRS), 6- CRS + H.A, 7- CRS + CK , 8- CRS + (Y), 9- Compost town refuse (CTR), 10- CTR + HA, 11- CTR+CK, 12- CTR+Y. All treatments were studied twice; once in the presence of a mixture of multi strains inoculants and the other without it. Also, the recommended doses of N, P and K fertilizers for onion was put in consideration as a comparable control treatment. Thus, the total number of treatment were 25.

Soil sample was collected from the experimental field and analyzed for some physical and chemical properties as shown in Table (1)

Table 1: Some physical and chemical properties of the experimental soil

Particle size distribution (%)				Textural class	EC dSm^{-1} (Sat. ext.)	pH	$CaCO_3$ (%)	O.M (%)	SP (%)
Coarse sand	Fine sand	Silt	Clay	Loamy					
2.9	25.5	33.2	38.4		0.98	7.75	2.91	1.07	49
Available element, $mg.kg^{-1}$									
N	P	K	Zn	Fe	Mn	Cu	Pb	Ni	Cd
43.5	4.95	289	0.91	5.66	2.93	0.19	2.68	1.04	0.33

Available concentrations of N, P and K were extracted and determined according to the methods described by **Hesse (1971).** Available Fe, Zn, Mn, Cu, Pb, Ni and Cd were extracted using DTPA and determined using atomic absorption spectrophotometer according to Chapman and Pratt (1982)

Ripe farmyard manure was taken from the station of animal production, Fac. Of Agric., Mansoura Univ., CTR was taken from Mansoura manufactory for organic manure. CRS was prepared in the site of the experiment as follows; the straw was chopped into 5 cm long pieces, piled, moistened with water and composted in association with a chemical accelerator (7 kg super phosphate and 40 kg ammonium sulphate per ton dry matter, 100 kg fertile soil per ton dry matter and 10 % FYM). At the initial stage of composting, the EM suspension was sprayed on the raw material amounted 10 liters/ton. During composting (3 months), materials were manually mixed at a week intervals to provide aeration. The moisture content during the composting course was kept at a proper level (60 % by weight) throughout irrigation **(El-**Hammady *et al.* 2003). Chemical analysis of the tested organic manures used were presented in Table (2)

Table 2: chemical analysis of the organic manures used

Organic manure	Organic manure properties							
	pH (1:5)	EC (1:10) (dSm^{-1})	Organic matter (%)	Organic carbon (%)	Total nitrogen (%)	C/N ratio	Total P (%)	Total K (%)
FYM	6.63	4.09	32.82	19.08	1.22	15.7	0.42	0.66
C.R.S	6.14	3.71	35.1	20.41	1.46	13.9	0.49	0.88
C.T.R	7.72	4.25	19.8	11.51	0.55	20.8	0.36	0.72

Organic manure	Available micro nutrients and heavy metals. ($mg.kg^{-1}$)						
	Fe	Mn	Cu	Zn	Pb	Ni	Cd
FYM	113.2	39.8	37.3	2.94	6.32	0.85	2.50
C.R.S	54.8	112.5	2.71	10.82	3.65	1.26	1.92
C.T.R	60.8	31.2	10.75	1.98	7.21	2.84	2.67

Organic manures were added to the soil before transplanting in a single application at rate of 15 $m^3 fed^{-1}$ for each i.e 24.2, 12.2 and 21.3 kg $plot^{-1}$ for FYM, CRS and CTR, respectively. Each experimental plot was mixed with FYM, CRS and CTR and irrigated up to saturation percentages. Then, plots were left for two weeks to elucidate the damage on seedlings and their roots resulted from the heat of decomposition.

Humic acid was obtained from Egyptian Fertilizer development Center. El-Mansoura. Chemical analysis of humic acid is shown in Table (3)

Table 3: Chemical analysis of humic acid used

pH	EC, dSm^{-1}	%				mg kg^{-1}		
		OM	N	P	K	Zn	Fe	Mn
7.33	1.04	66.9	2.13	0.19	3.73	2.48	398	187

Cytokinin in the form of 6-benzyl amino prines was obtained as a pure powder from Sigma Germany and a stock solution of 50 ppm was prepared. Preparation of yeast solution was done according to El-Ghamriny *et al.;* 1999 by mixing soft yeast with sugars at a ratio 1:1, left 3 hours at room temperature. Then, freezing it for distribution of yeast tissue and realizing their contents.

Growth regulators were used at rates of 0.5 %, 50 ppm and 10 gL^{-1} for humic substances, cytokinin and yeast, respectively. Each of them was used twice; once as soaking for seedling's roots before transplanting and the other as foliar spray 3 times; 15, 21 and 28 days after transplanting.

Cell suspension of *Azotobacter chroccoccum* (AZ), *Bacillus megatherium* (PSB) and *Bacillus circulans* (KSB) were kindly provided from the unit of biofertilizers, Fac. Agric. Ain shams Univ. Egypt. A mixture of them was proposed at equal parts (10^8 CFU). Onion seedlings were treated with the liquid suspension of this mixture as soaking before transplanting. Also, the mixture was applied at rate of 10 ml per seedling 3 times after 15 days of transplanting with 7 days intervals.

Control treatment was treated with 90, 60 and 48 kg fed^{-1} as a recommended doses of N, P and K for onion plant in the forms of ammonium sulfate (20.5 % N), super phosphate (15 % P_2O_5) and potassium sulfate (48 % K_2O). Full dose of P was added to the soil before transplanting while; N and K were added in two equal doses one after 15 days from transplanting and the other two, weeks later.

Seeds of onion c.v. Giza 20 were sown during the 2nd week of October, and seedling were transplanted in the field during the 1st week of December 2011 at distance of 20 cm apart within the rows of 15 cm within the plants. The area of each experimental plot was 10.5 m^2 (3 ridges, 70 cm width and 5 meter in length)

After 60 days from transplanting, samples of 5 onion plants were taken randomly from each experimental plot for investigation Plant growth parameters were recorded i.e., of plant length (cm), number of leaves per

plant, fresh and dry weight of whole plant (g plant^{-1}). At harvesting stage (120 days from transplanting) the total bulbs yield were weighed and yield component as average fresh and dry weight of bulbs (g plant^{-1}) and diameter of nick and bulb (cm) were measured. Finally the total yield (ton fed^{-1}) was calculated. Onion bulb samples from each experimental plot were taken for elemental analysis, where N,P and K elements in the dry matter of bulbs tissue were determined according to the methods of Peters *et al.,* (2003), Jackson (1973) and Black (1965), respectively. Fe, Zn, Mn, Cd, Ni and Pb concentrations were determined using atomic absorption spectrophotometer; model 1100 B as described by Chapman and Pratt (1982). For determination nutritional values of onion bulbs, total carbohydrates, total sugars, starch, vitamin C and nitrate contents were estimated according to the methods of Hedge and Hofreiter (1962), Sadasivam and Manickam, (1996), (A.O.A.C.; 2000), Singh (1988).respectively.

Obtained data were statistically analyzed according to the method described by Gomez and Gomez; 1984

RESULTS

A. Plant growth parameters

Onion plant growth parameters expressed as plant length, average leaves number, fresh and dry weight of whole plant as affected by the application of various organic manures with or without the application of different growth regulators under study are presented in Table (4).

It could be observed that the application of organic manure, i.e. farmyard manure (FYM), compost rice straw (CRS) and compost town refuse (CTR), all of them gained less vigor plant growth compared to the application of the recommended doses of N,P and K fertilizers. On the other hand, within the different organic manures the best plant growth parameters were obtained by onion plants receiving CRS followed in descending order by that supplied with FYM and lately CTR. The statistical analysis of the obtained data revealed that the difference within different organic treatments were great enough to be significant at 5% level.

Regarding the effect of growth regulators; data in Table (4) revealed that, treating the seedlings of onion plant with HA, Cytokinin or yeast significantly increased the mean values of growth parameters under study than those obtained for the untreated seedlings. In addition, inoculation of onion seedlings by the mixture of multi strains inoculants (Mix) combined with the various organic manures investigated and the different growth regulators gave a more pronounced values for plant growth parameters studied than those obtained for the uninoculated plants. In this respect the highest values were recorded with the plants treated with CRS, HA and inoculated with mixture of microorganisms.

Table (4): Plant growth parameters of Onion plant as affected by organic manures, foliar application and the and the inoculation with mixture of microorganisms in 2010-2011 season

Treatments		Char.	Plant height cm	No. of leaves	F.W(leaves) g plant^{-1}	D.W(leaves) g plant^{-1}
Control (100% RD. NPK)			74.90	14.56	71.42	6.08
FYM	Without	0	66.40	9.00	55.20	4.64
		Mix	69.10	10.67	58.10	5.01
	Humic acid	0	68.30	10.00	57.50	4.91
		Mix	70.80	11.67	61.30	5.39
	Cytokinin	0	66.90	9.33	55.90	4.74
		Mix	69.60	11.00	58.80	5.13
	Yeast	0	67.70	10.33	56.70	4.82
		Mix	70.50	11.67	60.60	5.25
Mean			68.66	10.46	58.01	4.99
Compost Rice straw	Without	0	71.60	10.00	62.80	5.53
		Mix	74.50	12.00	66.20	5.98
	Humic acid	0	73.60	11.00	65.10	5.84
		Mix	75.90	12.67	69.40	6.29
	Cytokinin	0	72.30	10.33	63.50	5.66
		Mix	74.80	12.33	67.10	6.10
	Yeast	0	72.90	11.00	64.30	5.75
		Mix	75.30	13.00	68.60	6.19
Mean			73.86	11.54	65.88	5.92
Compost Town refuse	Without	0	61.50	7.33	45.90	3.95
		Mix	64.30	9.33	49.30	4.41
	Humic acid	0	63.50	9.00	48.80	4.30
		Mix	65.90	10.67	52.60	4.68
	Cytokinin	0	62.10	7.33	46.70	4.06
		Mix	64.90	9.33	50.70	4.49
	Yeast	0	62.80	9.00	47.50	4.18
		Mix	65.70	10.67	51.90	4.57
Mean			63.84	9.08	49.18	4.33
L.S.D for 5%			1.13	2.31	0.95	0.08

Mix : mixture of *Azotobacter chrococcum, Bacillus megatherium, Bacillus circulans.*
RD : Recommended doses of NPK for Onion plant. F.w : fresh weight Dw : Dry weight

Generally; inoculation of onion seedlings with the mixture of multi strains inoculant in combination with the growth regulators and the various organic manure under investigation gave lower magnitudes of all growth parameters studied comparing with the control treatments; the rate of decreases were accounted to be 8.33, 1.39 & 14.77 % for plant height, 28.16, 20.74 & 37.64 % for number of leaves, 18.78, 7.76 & 31.14 % for fresh weight and 17.93, 2.63 & 28.79 % for dry weight under the treatments of FYM, CRS and CTR, respectively.

B. Total bulb yields and its components :

Statistical analysis of the data presented in Table (5) indicated that all treatments under study affected the average fresh and dry weight of bulbs (g plant^{-1}, diameter of nick and bulbs (cm) and total bulbs yield (Ton fed^{-1}). It is evident that the highest tonnages of total bulbs yield and its component are associated with the onion plants supplied N, P and K as chemical fertilizers at the recommended doses. Moreover, within the organic manures; the application of compost rice straw as organic source had the highest values for all the aforementioned traits, while the lowest values were realized for the plants treated with compost town refuse.

Table (5): Bulb and total yield ; ton.fed^{-1} for onion plant as affected by organic manures, foliar application and the inoculation with mixture of microorganisms in 2010-2011 season.

Treatments		Char.	Average F.W (bulb), g plant $^{-1}$	Average D.W (bulb), g plant $^{-1}$	Diam. of nick, cm	Diam. of b,ulb, cm	Total yield, Ton fed^{-1}
Control (100% RD. NPK)			190.25	21.33	4.66	8.18	16.83
FYM	Without	0	133.70	16.75	2.80	6.50	12.75
		Mix	145.10	17.62	3.60	7.30	13.82
	Humic acid	0	142.90	17.31	3.30	7.10	13.59
		Mix	158.60	18.93	4.10	7.90	14.61
	Cytokinin	0	136.10	16.53	2.90	6.60	12.98
		Mix	149.30	17.97	3.70	7.60	14.19
	Yeast	0	139.40	17.09	3.10	6.80	13.30
		Mix	154.90	18.62	3.80	7.80	14.42
Mean			145.00	17.60	3.41	7.20	13.71
Compost Rice straw	Without	0	162.90	19.17	3.40	7.40	14.83
		Mix	177.60	21.29	4.30	8.30	15.92
	Humic acid	0	173.80	20.79	3.90	8.10	15.65
		Mix	188.30	22.16	4.80	8.70	16.75
	Cytokinin	0	165.60	19.85	3.60	7.60	15.12
		Mix	181.70	21.69	4.40	8.40	16.29
	Yeast	0	169.40	20.27	3.70	7.70	15.31
		Mix	185.20	22.16	4.70	8.60	16.47
Mean			175.56	20.92	4.10	8.10	15.79
Compost Town refuse	Without	0	98.70	13.63	1.90	5.80	9.66
		Mix	115.90	15.10	2.80	6.70	10.82
	Humic acid	0	111.30	14.52	2.50	6.40	10.51
		Mix	125.90	16.49	3.30	7.20	11.72
	Cytokinin	0	102.60	13.28	2.20	5.90	9.89
		Mix	119.80	15.62	2.90	6.80	11.15
	Yeast	0	106.90	13.95	2.40	6.10	10.18
		Mix	123.10	16.09	3.10	7.00	11.46
Mean			113.03	14.84	2.64	6.49	10.67
L.S.D for 5%			2.41	0.30	0.06	0.09	0.19

Mix : mixture of *Azotobacter chrococcum, Bacillus megatherium, Bacillus circulans.*
RD : Recommended doses of NPK for Onion plant.

Concerning the effect of growth regulators studied, data in the same table illustrated that; soaking the roots of onion seedlings in organic substances before transplanting and leaves in foliar way after that significantly increased the mean values of total yield and its component than those obtained for the untreated plants. Using of humic acid was superior for increasing the aforementioned traits followed by yeast and lately cytokinin. It is clear from the data presented in Table (5) that inoculation of onion seedlings with the mixture of microorganisms studied combined with the various organic manures investigated and the different growth regulators gave a high values for total yield and its component of onion plant than those obtained for the un-inoculated plants. The highest mean values were obtained with the treatment of CRS + HA + Mix, which appeared to be approximately similar to that of the control treatment. Comparing with the control treatment; total bulb yield was decreased by 18.53, 6.18 & 36.6 % for the treatments of FYM, CRS and CTR, respectively. The same trend was realized for the yield of onion bulbs.

C. Nutritional content of onion bulbs :

Data presented in Table (6) show effect of the simple possible combination between the different organic manures studied and the growth regulators amendments in the presence and absence of biofertilization as compared to the mineral fertilization on the concentration of N, P and K % as well as Fe, Zn and Mn; ($mg.kg^{-1}$) for onion bulbs.

The obtained results clearly show that; the different sources of organic manures significantly affected the nutritional content of onion bulbs tissue. In spite of, the application of mineral fertilizers (control) was recorded the highest values of N, P and K %; such effect was found to be the lowest values of Fe, Zn and Mn ($mg.kg^{-1}$) in onion bulb tissues. The rate of decrease under the control treatment was accounted to be 19.67, 2.30 & 36.72 % for N%; the increases percentage were 32.89, 58.59 & 16.01 % for Fe for the treatments of FYM, CRS and CTR, respectively. The same trend was the same for the other nutritional elements investigated.

As for the effect of growth regulators, data in Table (6) showed that; a stimulation action was happened due to an addition of HA, CK and yeast as foliar application and soaking root of onion seedling on the average values of N, P, K, Fe, Zn and Mn concentration in onion bulbs as compared to the untreated treatment. The highest values of these elements were realized for the bulbs treated with HA followed in descending order by the plants received FYM and lately the treatment of yeast. This trend was the same for all sources of organic manures investigated. Moreover, inoculation of onion seedlings with the mixture of microorganisms significantly increased the average values of all nutritional elements studied than those obtained for the uninoculated one. The interaction effect between the treatments under study was reflected on the mean values of the nutritional element of onion bulbs as shown in Table (6). These values showed a positive effect on Fe, Zn & Mn %

and a negative effect on N, P & K % as compared to the control treatment. Generally, the most suitable treatment was the treatment of CRS + HA + Mix.

Table (6): Nutritional elements in the bulb of onion plant as affected by organic manures, foliar application and the inoculation with mixture of microorganisms in of 2010-2011 season.

Treatments		Char.	N%	P%	K%	Fe, $mgkg^{-1}$	Zn, $mgkg^{-1}$	Mn, $mgkg^{-1}$
Control (100% RD. NPK)			3.05	0.302	2.93	13.62	3.77	1.89
FYM	Without	0	2.45	0.335	1.90	18.10	5.40	2.90
		Mix	2.79	0.369	2.28	20.70	6.70	4.10
	Humic acid	0	2.67	0.357	2.19	19.90	6.30	3.70
		Mix	3.11	0.359	2.48	22.40	7.30	4.80
	Cytokinin	0	2.51	0.341	2.02	18.50	5.60	3.10
		Mix	2.86	0.377	2.35	21.30	6.80	4.20
	Yeast	0	2.58	0.348	2.11	19.20	5.90	3.40
		Mix	3.01	0.384	2.42	21.80	7.10	4.50
Mean			2.75	0.36	2.22	20.24	6.39	3.84
Compost Rice straw	Without	0	2.98	0.377	2.35	21.60	6.90	4.30
		Mix	3.36	0.411	2.63	24.20	7.80	5.20
	Humic acid	0	3.25	0.405	2.55	23.70	7.60	4.90
		Mix	3.59	0.426	2.86	25.90	8.70	5.70
	Cytokinin	0	3.07	0.386	2.41	22.30	7.20	4.50
		Mix	3.45	0.416	2.71	24.60	8.20	5.40
	Yeast	0	3.16	0.395	2.47	22.90	7.50	4.80
		Mix	3.51	0.419	2.78	25.10	3.40	5.50
Mean			3.30	0.40	2.60	23.79	7.16	5.04
Compost Town refuse	Without	0	1.93	0.290	1.56	15.80	3.90	1.60
		Mix	2.26	0.327	1.82	18.10	5.10	2.50
	Humic acid	0	2.15	0.316	1.73	17.80	4.60	2.30
		Mix	2.49	0.348	2.09	18.90	5.70	3.30
	Cytokinin	0	2.01	0.295	1.61	16.60	4.20	1.80
		Mix	2.33	0.335	1.93	18.50	5.30	2.70
	Yeast	0	2.07	0.306	1.68	17.20	4.30	1.90
		Mix	2.41	0.341	1.99	18.70	5.50	2.90
Mean			2.21	0.32	1.80	17.70	4.83	2.38
L.S.D for 5%			0.04	0.005	0.03	0.29	0.09	0.06

Mix : mixture of *Azotobacter chrococcum, Bacillus megatherium, Bacillus circulans.*

RD : Recommended doses of NPK for Onion plant.

D. Quality parameters of onion bulbs:

The mean values of total carbohydrates %, vitamin C, (mg/100g) and nitrate concentration as well as average heavy metal contents ($mg.kg^{-1}$) found in onion bulbs as influenced by organic manures, growth regulators with or without the mixture of multi strains inoculants are presented in Table (7).

The mean percentage of total carbohydrates and vitamin C revealed that ; the highest mean values were recorded for the plants treated with CRS + HA + Mix, while the lowest values were obtained from the control treatment. Comparing with the control treatment; single application of organic manures studied significantly increased the average values of total carbohydrates by

16.4, 29.8 & 3.1 % and vitamin C by 21.7, 55.4 & 16.9 % for the treatments of FYM, CRS and CTR, respectively. Data in Table (7), also indicated that an addition of HA, CK or yeast combined with any source of organic manures investigated significantly increased the mean values of the aforementioned traits than those obtained due to an application of the organic source alone.

Table (7): Quality parameters of Onion Bulbs as affected by organic manures, foliar amendments and the mixture of microorganisms comparing with the control treatment of 2010-2011 season.

Treatments		Char.	Total carbohydrates %	V.C (mg/100 g)	NO_3-N_1 mg kg^{-1}	Pb, $mgkg^{-1}$ (D.W)	Ni, $mgkg^{-1}$ (D.W)	Cd, $mgkg^{-1}$ (D.W)
Control (100% RD. NPK)			8.09	9.82	133.6	6.93	4.02	2.39
FYM	Without	0	9.42	10.22	107.3	4.49	2.40	1.25
		Mix	10.08	12.19	104.3	4.92	2.69	1.56
	Humic acid	0	9.83	11.67	105.1	4.80	2.61	1.48
		Mix	10.67	13.83	99.7	5.33	2.89	1.76
	Cytokinin	0	9.55	10.68	106.8	4.57	2.45	1.33
		Mix	10.32	12.81	103.2	5.09	2.75	1.64
	Yeast	0	9.71	11.19	106.1	4.71	2.53	1.39
		Mix	10.51	13.28	101.9	5.21	2.81	1.70
Mean			10.01	11.98	104.30	4.89	2.64	1.51
Compost Rice straw	Without	0	10.50	13.05	73.5	3.68	1.73	0.83
		Mix	11.26	14.77	66.8	3.93	2.08	1.12
	Humic acid	0	11.05	14.32	68.4	3.87	1.97	1.03
		Mix	11.55	15.79	63.4	4.21	2.28	1.35
	Cytokinin	0	10.69	13.45	71.8	3.72	1.84	0.90
		Mix	11.39	15.21	65.9	4.02	2.12	1.18
	Yeast	0	10.87	13.83	69.7	3.81	1.89	0.95
		Mix	11.48	15.56	65.1	4.11	2.18	1.27
Mean			11.10	14.50	68.08	3.92	2.01	1.08
Compost Town refuse	Without	0	8.34	8.40	92.9	5.50	3.12	1.68
		Mix	9.21	10.16	86.3	5.91	3.48	1.97
	Humic acid	0	8.96	9.69	88.7	5.79	3.39	1.88
		Mix	9.95	11.47	81.5	6.18	3.82	2.26
	Cytokinin	0	8.52	8.82	91.4	5.59	3.19	1.75
		Mix	9.47	10.63	84.1	5.98	3.61	2.08
	Yeast	0	8.79	9.30	90.6	5.66	3.28	1.81
		Mix	9.68	11.12	83.2	6.07	3.74	2.17
Mean			9.12	9.95	87.34	5.84	3.45	1.95
L.S.D for 5%			0.14	0.17	0.80	0.07	0.04	0.02

In this respect; the superiority effect was happened due to an addition of H.A addition followed by yeast and lately CK Moreover, inoculation of onion seedlings with the mixture of microorganisms had a stimulation effect on the contents of total carbohydrates and vitamin C of onion bulbs for all the treatments under investigation. On the contrary of this trend, huge amounts of nitrate and trace elements were accumulated in onion bulbs due to the addition of mineral fertilizers (control) more than those obtained for the plants

treated with different organic sources either in the presence or absence of the various growth regulators studied. In this respect; the highest mean values; 133.6, 6.93, 4.02 & 2.39 mg kg^{-1} were recorded for the bulbs treated with the recommended doses of N, P and K , while the lowest values; 68.08, 3.92, 2.01 & 1.08 mg kg^{-1} were resulted from the treatment of CRS + growth regulators for NO_3-N, Pb, Ni & Cd, respectively.

DISCUSSION

Results mentioned above revealed that; an application of organic manures under investigation gained less vigor plant growth, total bulb yields and its components on nutrient elements of onion bulbs as compared to the application of inorganic fertilizers (N, P and K RD).

These results could be explained on the basis of; inorganic fertilizers are an soluble forms of soil nutrients, which can be transported much more mobilized and readily than organic manure. Organic manures like FYM, CRS or CTR release nutrients very slowly to the plants. Therefore, are unable for supply excess required amount of nutrients in the critical period of plant growth. This may be the probable reason for the higher yield produce by the inorganic fertilizer applied for onion

The present results agreed with those obtained from onion plant by Arisha *et al.* (2003), Abbey and Kanton (2003); Gambo *et al.* (2008), Ouda and Mahadeen (2008) and Seran *et al*. (2010).

Within the organic manure sources; the best results were attained from onion plants receiving CRS following by that supplied with FYM and lately CTR. The beneficial effects of these organic manures are supplying, providing energy of microflora, increasing the availability of nutrients and improving soil fertility.

These results were in accordance with the finding of Mondal *et al.* (2004), Sharma *et al.* (2003), Aisha *et al.* (2007), Boyhan and Hill (2008), Yoldas *et al.* (2011) and Mansour (2012).

Inoculation of onion seedlings with the mixture of multi strains inoculants in combination with the growth regulators studied and the various organic manures under investigation gave higher value of all parameters than the application of organic manure alone. Moreover, such effect of this interaction gave, approximately the same values of inorganic fertilization for all the aforementioned traits. Such effects could be explained on these bases:

- Humic acid compounds may have various biochemical effects either at cell wall permeability membrane level or the cytoplasm including increased photosynthesis and respiration rates in plants, enhancing protein synthesis and enhance the uptake of minerals through the stimulation of migrobiological activity (Mayhew, 2004 and Anonymous, 2010).
- Cytokinins can stimulate cell division and the growth of lateral buds, release of topical dominance, stimulate leaf expansion resulting from cell enlargement and stimulation of chlorophyll synthesis. (Choi *et al.* 2010 and Grobkinsky *et al.* 2011).

- The positive effect of yeast may be attributed to its active role in the hydrolysis of carbohydrates and protein and increasing the synthesis of plant growth promoters, especially GA3, IAA and Cytokinin (Dawa *et al*; 2008 and Manoly and Nasr; 2008)
- The improving effects of the mixed biofertilizers may be attributed to the role played by N-fixing, P and K solubilizing bacteria in secreting chelate substances; as organic acids which are important for solubilization of springly soluble inorganic P. Moreover, the hormonal exudates of Azotobacter sp. can modify root growth, morphology and physiology resulting in more absorption of N, P and K from the soil. (Badawy *et al;* 2003, Saleh *et al;* 2007, Salim *et al;* 2007 and Baddour; 2010)

Finally, an application of organic manures in the soil could be enriched soil if it is found feasible and applicable. Therefore, heavy metals will prefer to form chelates with organic compounds. By this way, extractable heavy metals concentrations will be minimized by using organic material (Kara *et al;* 2004)

CONCLUSION

Under the same conditions of this investigation it could be recommended that inoculation of onion seedlings with the mixture of multi strains inoculants combined with compost rice straw at rate of 15 m^3 fed^{-1} and the addition of humic acid are considered as the most suitable treatment for realizing the highest economic and safe yield of onion bulbs.

REFERENCES

A.O.A.C (1990). Association Official Analatical Chemists. Official Methods of Analysis. 15th Ed. Washington, DC, USA.

Abbey, L. snd R. A. L. Kanton (2003). Fertilizer type, but not time of cessation of irrigation, effect onion development and yield in a semiarid region. J. Veg. Crop Proc., 9 (2): 41-48.

Aisha, A. H.; A. R. Fatma, A. M. Shaheen and A. M. Mona (2007). Onion plant growth, bulbs yield and its physical and chemical properties as affected by organic and natural fertilization. Res. J. Agric. & Biol. Sci., 3(5): 380-388.

Anonymous (2010). Humic and fulfic acid; the black gold of agriculture? http:// www.humintech.com/pdf/humicfulficacids.pdf

Arisha, H.M.A., A.A. Gad, and S. E. younes , (2003). Response of some pepper cultivars to organic and mineral nitrogen fertilizer under sandy soil condition. Zagazig journal Agri. Res., 30: 1875-1899

Badawy, F. H.; El Dsouky, M. M.; Sadiek, H. S.; Abo Baker, A. A., 2003. Response of tomato to inoculation with single and multi-strain inoculants of different bacterial species. Assiut Journal of Agricultural Sciences 34(5): 275-286

Baddour, A.G. (2010) "Effect of bio-fertilization on growth and productivity of tomato plant". M. Sc. thesis Fac. Of Agri. Mans. Univ.

Black, C. A. (1965). Methods of Soil Analysis. Part 2. Amer. Soci. of Agric. [NC] Publisher, Madison, Wisconsin.

Boyhan, G. E. and C. R. Hill (2008). Organic fertility sources for the production of short-day organic onion transplants. Hortichnology. 18 (2): 227-231.

Chapman, H. D. and P. F. Pratt (1982) ''Methods of Analysis for Soils, Plants and Water. Univ. California, Div. Agric. Sci. Priced Pub. 4034

Choi, J., S.U. Huh, M. Kojima, H. Sakakibara, K.H. Paek, and I. Hwang, (2010) The cytokinin-activated transcription factor ARR2 promotesplant immunity via TGA3/NPR1-dependent salicylic acid signaling in Arabidopsis. Developmental Cell, 19, 284–295.

Dawa, K. K. ; E. A. A. Tartoura and H. A., Darweesh (2008) ''Effect of some different organic and biofertilizers and foliar application treatments on pea crops. I. Agric. Sci. Mansoura Univ., 33 (5) : 3573-3595

El-Ghamriny, E. A.; H. M. E. Arisha, and K. A. Nour, (1999) : Studies on tomato flowering, fruitset, yield and quality in summer seasons. 1- spring with thiamine, ascorbic acid and yeast. Zagazig J. Agric. Res., 26 (5) :1345-1364.

El-Hamaddy, A.M. ; A.F. Abo-Hadid, Sh. M. Selim ; H.I. El-Kassas and N. Negm (2003). Production of compost from rice straw using different accelerating amendments. I. Environ. Sci. Ain Shams Univ., 6 (3): 112-116

Gambo, B. A.; M. D. Magaji, A. I. Yakubu and A. U. Dikko (2008). Effects of Farmyard Manure, Nitrogen and Weed Interference on the Growth and Yield of Onion (*Allium cepa l.*) at the Sokoto Rima Valley. J . Sustain able Development in Agriculture & Environment. 3 (2): 87-92.

Gomez, K.A. and A.A. Gomez, 1984 "Statistical Procedure for Agricultural Research 2nd ed. Intl. rice res. Inst. John welly, Singabore. Pd. 28-192

Großkinsky D.K; M. Naseem, U. R. Abdelmohsen, N. Plickert, T. Engelke, T. Griebel, J. Zeier, O. Novák, M. Strnad, H. Pfeifhofer, E. van der Graaff, U. Simon and T. Roitsch (2011). "Cytokinins mediate resistance against Pseudomonas syringae in tobacco through increased antimicrobial phytoalexin synthesis independent of salicylic acid signaling". Plant Physiology 157 (2): 815–830.doi:10.1104/pp.111.182931. PMC 3192561. PMID 21813654.

Hedge, I.E. and B. T. Hofreiter, (1962). "Carboydrate Chemistry i7 (Eds Whistler R.L. and Be Miller, J.N.) Academic Press New York.

Hesse, P. R. (1971) : A text book of soil chemical analysis. Ivan Murry (puplisher), Ltd., London

Jackson, M. L. (1973). "Soil Chemical Analysis advanced course" Puble. By the auther, Dept. of Soils, Univ. of Wise., Madison 6, Wisconsin, U.S.A.

Kara, E.E; Pirlak, U. and Ozdilek, G. H. (2004): Evaluation of heavy metals (Cd, Cu, Ni, Pb and Zn) distribution in sowing regions of potato fields in Turkey. Fac. Of economics and public administration, Antakya, Hatay, Turkey

Manoly, N. D. and A. A. Nasr (2008). "Response of two cultivars of gladulus to chiken manure in the new reclaimed land. J. Agric. Sci. Mansoura Univ., 33 (12) : 2799-8808.

Mansour, A. A. (2012) Standardization of micronutrients enrichment technique in organic manures and its impact on soil and crop. M.SC. Tamil nadu Agric. Univ.

Mayhew, L. (2004). Humic substances in biological agriculture (online). Available www.acresusa.com/toolbox/reprints/jan04_Humic20%substances.pdf2004.

Mondal, S.S., A. Depabrata, G. Anup and U. Thaba. (2004) Integrated management of organic and inorganic sources of nutrient to improve productivity in rice onion cropping sequence and qualitative characters of rice and environment and ecology, MKK publication, calculate, India, 22 (1) : 125-128

Ouda, B.A. and A.Y. Mahadeen, (2008) Effect of fertilizers on growth, yield, yield components, quality and certain nutrient contents in Broccoli (*Brassica olarecia*). International J. of Agric. And Biology, 10 (6) : 627-632

Peters, I.S.; Combs, B.; Hoskins, I., Iarman; I. kover, M. Watson and N. Wolf (2003). Recommended methods of manure analysis. Univ. of Wisconsin, Cooperative extension Publ., Madison.

Puget, P. and R. Lal (2005). Soil organic carbon and nitrogen in a Mollisol in central Ohio as affected by tillage and land use. Soil Tillage Res. 80 (1-2) :201-213.

Sadasivam, S. and A. Manickam (1996). Biochemical Methods, second edition, New age inter. India.

Saleh, M. M., M. Fayza, A. Darwish and M. H. Mona (2007). Effect of different types and levels of organic fertilizers combined with biofertilizers on growth and yield of tomato grown in sandy soil, J. Agric. Sci. Mans. Univ; 32 (7): 5553-5568

Salim, E. M.; H. G. Abu El-fotoh and M. H. A. El-mancy (2007). Productivity of tomato plants treated with some biological, organic and inorganic fertilizers. Egypt. J. Soil Sci. 47, No. 3, pp 215-231.

Seran, T. H.; S. Stikrishnah and M. M. Ahmed (2010). Effect of different levels of inorganic fertilizers and compost as basal application on the growth and yield of onion. Dept. of Crop Sci., Fac. Agric. Estern Univ., Srilanka.

Sharma, R. P.; N. Datt and P. K. Sharma (2003). Combined application of nitrogen, phosphorus, potassium and farmyard manure in onion (*Allium cepa*) under high hills, dry temperate conditions of north western Himalayas. Ind. J. Agric. Sci., 73(4): 225-227.

Singh, J. P. (1988). A rapid method for determination of nitrate in soil and plant extracts. Plant and Soil. 110: 137-139.

Yoldas, F.; S. Ceylan, N. Mordogan and B. C. Esetlili (2011). Effect of organic and inorganic fertilizers on yield and mineral content of onion (*Allium cepa L.*). African J. Biotech., 10(55):11488-11492.

فائدة إستخدام بعض منظمات النمو على البصل المزروع عضويا مقارنة بالتسميد المعدني.

زكريا مسعد الصيرفي*، أيمن محمد الغمري*، صلاح الدين حسين سرحان و أحمد جمال الدين بدور****

*** قسم الأراضي – كلية الزراعة – جامعة المنصورة**

**** مركز البحوث الزراعية – معهد بحوث الأراضي والمياه والبيئة – الجيزة – مصر**

تم تنفيذ تجربة حقلية في المزرعة القريبة من كلية الزراعة – جامعة المنصورة خلال الموسم الشتوي 2011-2012 لدراسة كل التداخلات الممكنة بين الأسمدة العضوية ومنظمات النمو والتسميد الحيوي على انتاج محصول أمن من البصل.

نفذت التجربة في تصميم كامل العشوائية في 3 مكررات مشتملا على 24 معاملة على النحو التالي :

1- سماد بلدي 2- سماد بلدي +حمض هيوميك 3- سماد بلدي + سيتو كينين 4- سماد بلدي +خميرة 5- كمبوست قش الأرز 6- كمبوست قش الأرز +حمض هيوميك 7- كمبوست قش الأرز + سيتوكينين 8- كمبوست قش الأرز + خميرة 9- كمبوست قمامة المدن 10- كمبوست قمامة المدن + حمض هيوميك 11- كمبوست قمامة المدن + سيتوكينين 12- كمبوست قمامة المدن +خميرة.

جميع المعاملات تم اختبارها مرتين ، مرة في وجود مخلوط الكائنات الحية الدقيقة وأخرى في عدم وجودها – معاملة الكونترول تم معاملتها بالكميات الموصى بها من النيتروجين والفوسفور والبوتاسيوم .. أي أن الإجمالي هو 25 معاملة

أظهرت النتائج ما يلي :

- إضافة الأسمدة العضوية موضوع الدراسة منفردة أعطت قيماً أقل من التسميد المعدني لجميع الصفات موضوع الدراسة مثل صفات النمو، المحصول والتركيب المحصولي للبصل، المحتوى المعدني من العناصر.
- بالنسبة للأسمدة العضوية حقق إستخدام كمبوست قش الأرز أحسن النتائج وتبعه السماد البلدي واخيرا كمبوست قمامة المدن.
- التلقيح البكتيري للشتلات في وجود منظمات النمو والأسمدة العضوية سجل أعلى القيم لجميع الصفات – وكانت تلك القيم تقريبا مثل القيم الناتجة عن التسميد المعدني.

قام بتحكيم البحث

أ.د / السيد محمود الحديدى	**كلية الزراعة – جامعة المنصورة**
أ.د / السيد عوض محمد	**كلية الزراعة – جامعة الزقازيق**